**General information**

If you have not already done so, upgrade to OS 2.55MP and PlySmlt2.

Applications
They are accessed by pressing [APPS].
The TI-84/TI-83 applications (APPS) allowed by the IB are PlySmlt2 and Finance.

**Sending and receiving an APP or program**
To receive [2nd] [X,T,θ,n] ➔ RECEIVE ➔ 1: Receive
To send [2nd] [X,T;θ,n] ➔ SEND ➔ C:Apps. Select the app. [ENTER] ➔ TRANSMIT ➔ 1: Transmit

**Troubleshooting**

**Dimension error**
Usually comes from having a STATPLOT on.
Can also occur if you’re doing statistics and one list have more entries than the other. Clear your list.

**Err: Window range**
means you set X (or Y) min bigger than max

**Limitations**

The TI does not always give the exact value, for example X = 5.673546567E-12 as an output is an attempt by the TI to report “X = 0”; note the E-12 at the end.

5.64 × 10^{12} is shown as 5.64E12
2.4 × 10^{-7} is shown as 2.4E-7

**Basics**

To re-use a previous entry
scroll up, press [ENTER]

To get to the start or end (of a long expression or list)
[2nd] [◄] or [►] as needed.

To store an answer
[STO→] [ALPHA] [A LETTER OF YOUR CHOICE]
Use the answer later by replacing the number with the letter.

The fraction template
[ALPHA] [Y=] ➔ 1:n/d.

Type your formula into

The template eliminates the need for puzzling out brackets in complicated fractions.

Example:
To convert a decimal to a fraction

To simplify fractions

**Algebra**

Evaluating logs
Example: Solve 3 = 2^x
x = \log_2 3

[ALPHA] [WINDOW] ➔ 5: logBASE

\[ \log_2(3) = 1.584962501 \]

x = 1.58

Binomial coefficients
Example: Evaluate \( \binom{5}{3} \)

[MATH] ➔ PRB ➔ 3:nCr

\[ \binom{5}{3} = 5 \ nCr 3 = 10 \]

So \( \binom{5}{3} = 10 \)
Using Plysmlt2

Polynomial Root Finder

The Polynomial Root Finder can find the roots (i.e., zeros, solutions) for any polynomial with real coefficients up to degree 10.

Example: Solve $3x^3 - 2x + 1 = 0$

<table>
<thead>
<tr>
<th>POLY ROOT FINDER MODE</th>
<th>ORDER</th>
<th>REAL</th>
<th>DEC</th>
<th>NORMAL</th>
<th>FLOAT</th>
<th>RADIAN</th>
<th>DEGREE</th>
<th>NEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER</td>
<td>12345678910</td>
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<td></td>
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<td></td>
<td>SEL</td>
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<td>a+bi</td>
<td>re^θ(i)</td>
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<tr>
<td>DEC</td>
<td>FIX</td>
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<td>NORMAL</td>
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</tbody>
</table>

The only real solution is $x = -1$

Simultaneous Equation Solver

The Simultaneous Equation Solver can solve up to 10 unknowns and 10 equations simultaneously.

Example: Solve $2x + 3y = 5$ and $3x + 5y = 7$

<table>
<thead>
<tr>
<th>SIMULT EQU SOLVER MODE</th>
<th>EQUATIONS</th>
<th>UNKNOWN</th>
<th>DEC</th>
<th>NORMAL</th>
<th>FLOAT</th>
<th>RADIAN</th>
<th>DEGREE</th>
<th>NEXT</th>
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</thead>
<tbody>
<tr>
<td>EQUATIONS</td>
<td>345678910</td>
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<td>SEL</td>
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<td>UNKNOWN</td>
<td>345678910</td>
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<td>NEXT Type it in</td>
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</tbody>
</table>

Graphing

Intersections of 2 curves (solutions of equations)

Enter your equations

<table>
<thead>
<tr>
<th>Plot1</th>
<th>Plot2</th>
<th>Plot3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1 = 2sin(x)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Y2 = cos(2x)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Zoom $\rightarrow$ ZTrig

<table>
<thead>
<tr>
<th>2nd</th>
<th>[TRACE] $\rightarrow$ 5: intersect</th>
</tr>
</thead>
</table>

To store results from intersection or maximum, etc.
Keying [ENTER] will store the X and Y values of that point stored in variables X and Y respectively. Recall the x value with [X,T,θ,n] or with [ALPHA] [X], Recall the y value with [ALPHA] [Y].

Zeros (solutions of equations)

Enter your equation

<table>
<thead>
<tr>
<th>Plot1</th>
<th>Plot2</th>
<th>Plot3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y1 = 2sin(x) - cos(x)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[2nd] [CALC] $\rightarrow$ 2: zero
Left Bound (anywhere left of the zero)
Right Bound (anywhere right of the zero)

<table>
<thead>
<tr>
<th>2nd</th>
<th>[TRACE] $\rightarrow$ 5: intersect</th>
</tr>
</thead>
</table>

To store results from intersection or maximum, etc.
Keying [ENTER] will store the X and Y values of that point stored in variables X and Y respectively. Recall the x value with [X,T,θ,n] or with [ALPHA] [X], Recall the y value with [ALPHA] [Y].

NOTE! Do not use TRACE &/or ZOOM to find the intersections and intercepts. TRACE skips from one pixel element to the next. If the x-value of a pixel element happens to be exactly the x-value of an intercept or intersection, you will get the right answer. Otherwise the closest pixel element will almost certainly not be correct to 3 significant figures. ZOOM will allow you to zoom in on an intercept or intersection. Eventually you will zoom in enough that TRACE will give enough significant figures, but this is very clumsy and time consuming compared to using CALC.
Maxima & Minima

[2nd] [TRACE] → 2: zero

Left Bound [ENTER]

Right Bound [ENTER]

Graphing the Inverse

Example: Graph the inverse of \( y = x^2 + 2 \)

[Y=] enter your equation

[ZOOM] → 5: ZSquare

NOTE! Insert Y1 by pressing [ALPHA] [TRACE] → 1:Y1

The TI-84 does not care if \( f(x) \) passes the Horizontal Line Test

Note! The Vertical asymptote of logs is not visible (but it is there!)

Calculus

Numerical derivative

Example: \( f(x) = x^2 \). Find \( f'(2) \)

[ALPHA] [WINDOW] 3:nDeriv

\[
\frac{d}{dx}(x^2) \bigg|_{x=2} = 4
\]

An analytical derivative (e.g. \( f'(x) = 2x \) in this example), cannot be found with the TI-84.

Find the tangent line

Example. Find the tangent line of \( y = x^2 \) at \( x = 2 \).

Put \( x^2 \) in [Y=] [GRAPH] [2nd] [PRGM] → 5:Tangent

\( x = 2 \)

The tangent line is \( y = 4x - 4 \)

Definite integral

Example: Evaluate \( \int_1^3 x^2 \, dx \)

[2nd] [TRACE] → 7: \( \int f(x) \, dx \)

Lower bound

\( Y1 = x^2 \)

The integral is 8.67

Alternative way

[ALPHA][WINDOW] 4: fnInt

The integral is 8.67

Using a TABLE to solve

Ex: $5000 is invested at 6.3%. The value of the investment will exceed $10 000 after \( n \) full years. Calculate the minimum value of \( n \).

[Y=] enter your equation

scroll to \( Y > 10000 \)
Putting a list in the STAT list editor

[STAT] → EDIT → 1:Edit. Type in your list.

Clearing the contents of a list

Move the cursor up to the name of the list, e.g. L1
[CLEAR]. (Do not key DEL. DEL deletes the list entirely, including the name, i.e. “L1” itself disappears.)

Recreating a list

If you have accidentally deleted a list (not just the contents, but the name itself), for example L1, and want it back you need to set up your editor again
[STAT] → 5:SetUpEditor [ENTER].

Mean and Standard Deviation

[STAT] → EDIT

Type your values into L1. If you have frequencies, type them into L2. (The example below does not use the above numbers.)

[STAT] → CALC → 1-Var Stats

If you just have values in L1 type 1- Var Stats L1
If you have values in L1 and frequencies in L2
Type 1-Var Stats L1, L2 (on newer TI-84’s it will ask for list and frequencies)

The mean is \( \bar{x} \)
The standard deviation is \( \sigma_x \).

Correlation coefficient

NOTE! Make sure you have your diagnostics turned ON.

[MODE] → STAT DIAGNOSTICS (Choose ON)

Example: The number of bottles of water sold at a railway station on each day is given in the following table. Find the equation of the regression line and the correlation coefficient.

<table>
<thead>
<tr>
<th>Day</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°F)</td>
<td>21</td>
<td>20.7</td>
<td>20</td>
<td>19</td>
<td>18.7</td>
<td>17.3</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>20</td>
<td>20.7</td>
<td>21</td>
<td></td>
</tr>
</tbody>
</table>

| Number of bottles sold (n) | 150 | 141 | 126 | 125 | 98 | 101 | 93 | 99 | 116 | 121 | 119 | 134 | 141 |

[STAT] → EDIT → 1: Edit. Type your data in L1 and L2

[STAT] → CALC → 4: LinReg(ax+b).

Xlist: L1
Ylist: L2 → Calculate

The equation of the regression line is \( y = 11.5x - 100 \) and the correlation coefficient is 0.942

Normal distribution

NOTE! [normalpdf is not needed ever]

Using normalcdf()

Example: Given \( \mu = 20, \sigma = 3 \) find Prob(19 ≤ X ≤ 23)

[2nd] [VARS] → 2: normalcdf

\[
\text{normalcdf}(19, 23) \approx 0.471903368
\]

Using invNorm

Example: Given \( \mu = 20, \sigma = 3 \) find \( d \) such that 5% is less than \( d \)

[2nd] [VARS] → 3:invNorm

\[
\text{invNorm}(0.05, 20) \approx 15.06543912
\]

\( d = 15.1 \)

Example: Given \( \mu = \mu, \sigma = 3 \) and that 20% of the distribution is less than 10. Find \( \mu \).

[2nd] [VARS] → 3:invNorm

\[
\text{invNorm}(0.80, 3) \approx 10.656543912
\]
\[ -0.84162 = \frac{10 - \mu}{3} \]

\[ \mu = 7.48 \]

\[ z = \frac{x - \mu}{\sigma} \text{ is in Info booklet} \]

**Using `binompdf`, `binomcdf`**

*Example: If \( n = 6, p = 0.75 \), find \( P(X = 6) \).*

1. Press `[2nd] [VARS] \( \rightarrow \) DISTR \( \rightarrow \) A: `binompdf` \( \rightarrow \)`

2. Key the values into the template:

   - **trials:** 6
   - **p:** 0.75
   - **x value:** 6

3. Press `[ENTER]` three times to get

   \[ \binom{6}{0.75}(6, 0.75) = 0.1779785156 \]

B: `binomcdf` works the same way